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U. S. DEPARTMENT OF AGRICULTURE.

REPORT

OF

THE BOTANIST

FOR

1893.

BY

FREDERICK V. COVILLE.

FROM THE REPORT OF THE SECRETARY OF AGRICULTURE FOR 1893.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1894.

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REPORT OF THE BOTANIST.

SIR: I have the honor to submit herewith my report as Botanist of the U. S. Department of Agriculture for the period from March 8 to December 31, 1893.

Very respectfully,

FREDERICK V. COVILLE,
Botanist.

Hon. J. STERLING MORTON,
Secretary.

The former Botanist, Dr. George Vasey, was removed by death on the 4th day of March, 1893, after a period of twenty-one years' labor in the same official capacity. The untiring industry with which he devoted himself to his work can be appreciated best by reference to the résumés which were published in the Annual Reports of the Commissioner and later of the Secretary of Agriculture.

As partially indicative of the work accomplished by the Division of Botany before March 8, 1893, a list of its publications up to that date is here given. Prior to the year 1883 all official reports of the work of this division, like those of nearly all other branches of the Department, were published in the Annual Report of the Commissioner of Agriculture.

PUBLICATIONS PRIOR TO MARCH 8, 1893.

BULLETINS.

- Bulletin No. 1. Report of an Investigation of the Grasses of the Arid Districts of Kansas, Nebraska, and Colorado. By George Vasey. 1886. 8°, pp. 19, 13 plates.
- Bulletin No. 2. Report on the Fungous Diseases of the Grape Vine. By F. Lamson-Scribner. 1886. 8°, pp. 136, 7 plates.
- Bulletin No. 3. Grasses of the South. A Report on Certain Grasses and Forage Plants for Cultivation in the South and Southwest. By George Vasey. 1887. 8°, pp. 63, 26 plates.
- Bulletin No. 4. Desiderata of the Herbarium for North America North of Mexico. Ranunculaceæ to Rosaceæ, inclusive. By George Vasey. 1887. 8°, pp. 15.
- Bulletin No. 5. Report on the Experiments made in 1887 in the Treatment of the Downy Mildew and the Black-rot of the Grape Vine; with a chapter on the Apparatus for Applying Remedies for these Diseases. By F. Lamson-Scribner. 1888. 8°, pp. 113; illustrated by figures in the text.
- Bulletin No. 6. Grasses of the Arid Districts. Report of an Investigation of the Grasses of the Arid Districts of Texas, New Mexico, Arizona, Nevada, and Utah, in 1887. By George Vasey, S. M. Tracy, and G. C. Nealley. 1888. 8°, pp. 61, 30 plates.
- Bulletin No. 7. Black-rot (*Uromyces Bidwellii*). By F. Lamson-Scribner and Pierre Viala. 1888. 8°, pp. 29, 1 plate.

- Bulletin No. 8. A Record of some of the Work of the Division, including Extracts from Correspondence and other Communications. By George Vasey and B. T. Galloway. 1889. 8°, pp. 67.
- Bulletin No. 9. Peach Yellows: A Preliminary Report. By Erwin F. Smith. 1888. 8°, pp. 254, 9 maps, 37 plates.
- Bulletin No. 10. Report on the Experiments Made in 1888 in the Treatment of the Downy Mildew and Black-rot of the Grape Vine. By F. Lamson-Scribner, Alex. W. Pearson, H. L. Lyman, Hermann Jaeger, A. M. Howell, and M. Prillieux. 1889. 8°, pp. 61, 2 plates.
- Bulletin No. 11. Report on the Experiments made in 1889 in the Treatment of the Fungous Diseases of Plants. By B. T. Galloway. 1890. 8°, pp. 119, 8 plates.
- Bulletin No. 12.* Grasses of the Southwest. Plates and Descriptions of the Grasses of the Desert Region of Western Texas, New Mexico, Arizona, and Southern California. By George Vasey. Part I.—Issued October 13, 1890. Roy. 8°, pp. 107, 50 plates. Part II.—Issued December, 1891. Roy. 8°, pp. 108, 50 plates.
- Bulletin No. 13.* Grasses of the Pacific Slope, Including Alaska and the Adjacent Islands. Plates and Descriptions of the Grasses of California, Oregon, Washington, and the Northwestern Coast, including Alaska. By George Vasey. Part I. Issued October 20, 1892. Roy. 8°, pp. 108, 50 plates.
- Bulletin No. 14. Ilex Cassine, the Aboriginal North American Tea. Its History, Distribution, and Use among the Native North American Indians. By E. M. Hale, 1891. 8°, pp. 22, 1 plate.

CONTRIBUTIONS.

- Contributions from the U. S. National Herbarium, Vol. I, No. 1. List of Plants Collected by Dr. Edward Palmer in 1888 in Southern California; by George Vasey and J. N. Rose. List of Plants Collected by Dr. Edward Palmer in 1889 at (1) Lagoon Head, (2) Cedros Island, (3) San Benito Island, (4) Guadalupe Island, (5) Head of the Gulf of California; by George Vasey and J. N. Rose. Issued June 13, 1890. 8°, pp. viii, 1-28.
- Contributions from the U. S. National Herbarium, Vol. I, No. 2. Upon a Collection of Plants made by Mr. G. C. Nealley in the Region of the Rio Grande, in Texas, from Brazos Santiago to El Paso County. By John M. Coulter. Issued June 28, 1890. 8°, pp. iii, 29-61, index.
- Contributions from the U. S. National Herbarium, Vol. I, No. 3. List of Plants Collected by Dr. Edward Palmer in Lower California and Western Mexico, at (1) La Paz, (2) San Pedro Martin Island, (3) Raza Island, (4) Santa Rosalia and Santa Agueda, (5) Guaymas. By George Vasey and J. N. Rose. Issued November 1, 1890. 8°, pp. iii, 63-90, index.
- Contributions from the U. S. National Herbarium, Vol. I, No. 4. List of Plants Collected by Dr. Edward Palmer in 1890 in Western Mexico and Arizona, at (1) Alamos, (2) Arizona. By J. N. Rose. Issued June 30, 1891. 8°, pp. iii, 91-127, index, 10 plates.
- Contributions from the U. S. National Herbarium. Vol. I, No. 5. List of Plants Collected by Dr. Edward Palmer in 1890 on Carmen Island. By J. N. Rose. List of Plants Collected by the U. S. S. *Albatross* in 1877-'91 along the Western Coast of America; by J. N. Rose, D. C. Eaton, J. W. Eckfeldt, and A. W. Evans. Revision of the North American species of *Hoffmanseggia*; by E. M. Fisher. Systematic and Alphabetic Index of New Species of North American Phanerogams and Pteridophytes, published in 1891; by Josephine A. Clark. Issued September 20, 1892. 8°. pp. v, 129-188, index, 5 plates.
- Contributions from the U. S. National Herbarium, Vol. I, No. 6. List of Plants Collected by C. S. Sheldon and M. A. Carleton in the Indian Territory in 1891; by J. M. Holzinger. Observations of the Native Plants of Oklahoma Territory and Adjacent Districts, by M. A. Carleton. Issued December 6, 1892. 8°. pp. v, 189-232, index, 2 plates.
- Contributions from the U. S. National Herbarium, Vol. II, No. 1. Manual of the Phanerogams and Pteridophytes of Western Texas. By John M. Coulter. Issued June 27, 1891. 8°, pp. v, and 1-152, index, 1 plate.
- Contributions from the U. S. National Herbarium, Vol. II, No. 2. Manual of the Phanerogams and Pteridophytes of Western Texas. By John M. Coulter. Issued June 1, 1892. 8°, pp. v, 153-345, index, 2 plates.
- Contributions from the U. S. National Herbarium, Vol. III, No. 1. Monograph of the Grasses of the United States and British America. By George Vasey. Issued February 25, 1892. 8°, pp. v, 1-89, index.

* Extra editions of Bulletins Nos. 12 and 13 have been issued also as Volumes I and II of a work entitled, *Illustrations of North American Grasses*.

ANNUAL REPORTS.*

- Report of the Botanist for the year 1886. By George Vasey. 1887. 8°, pp. 69-93, 21 plates.
 Report of the Botanist for the year 1888. By George Vasey. 1889. 8°, pp. 305-324, 13 plates.
 Report of the Botanist for the year 1889. By George Vasey. 1890. 8°, pp. 377-396, 11 plates.
 Report of the Botanist for 1890. By George Vasey. 1891, 8°, pp. 375-392, 8 plates.
 Report of the Botanist for 1891. By George Vasey. 1892. 8°, pp. 341-358, 10 plates.

MISCELLANEOUS.†

- Special Report No. 63. The Grasses of the United States; being a Synopsis of the Tribes and Genera, with Descriptions of the Genera, and a List of the Species. By George Vasey. 1883. 8°, pp. 47.
 The Agricultural Grasses of the United States; by George Vasey. The Chemical Composition of American Grasses; by Clifford Richardson. 1884. 8°, pp. 144, 120 plates.
 A Descriptive Catalogue of the Grasses of the United States, including especially the Grass Collections at the New Orleans Exposition, made by the U. S. Department of Agriculture and the State Exhibits of Grasses, with notes on such species as are more or less employed in agriculture, or deserving of trial for cultivation. By George Vasey. 1885. 8°, pp. 110.
 Special Bulletin. The Agricultural Grasses and Forage Plants of the United States, and such Foreign Kinds as have been Introduced, with an Appendix on the Chemical Composition of Grasses, by Clifford Richardson; and a Glossary of Terms used in Describing Grasses. A new, revised, and enlarged edition. By George Vasey. 1889, 8°, pp. 148. 114 plates.
 Grass and Forage Experiment Station at Garden City, Kans. By J. A. Sewall. Coöperative Branch Stations in the South. By S. M. Tracy. 1892. Reprinted by authority of the Secretary of Agriculture from his Annual Report for 1891. 8°, pp. 12.

ORGANIZATION OF THE DIVISION.

The work of the Division of Botany as outlined by act of Congress is separable into two groups: (1) the investigation of forage plants, weeds, medicinal plants, and other subjects in economic botany; (2), the custody of a collection of plants of the United States, and to some extent of other countries, and continued additions to it. The subjects mentioned under the first group are so nearly representative, in a particular line, of the whole work of the Department that the method of their execution requires no especial explanation. But the treatment of the plant collections, in view, on the one hand, of their necessity in the work of the Department, and on the other hand, of the large dimensions which they have assumed and the increased expenditure which they might entail, if not properly managed, is a subject which requires more careful consideration.

THE HERBARIUM.

With regard to the nature of these collections it may be said briefly that they contain series of the plants brought back from nearly all the transcontinental surveys from the time of Nicollet and Fremont onward, and from United States Government expeditions to the Arctic regions, to South America, to Africa, and to the islands of the Pacific, together with sets obtained from many recent collectors in the newer parts of our own country, many miscellaneous donations of amateur or

* No separate editions of the annual report of the Botanist were issued prior to the one for 1886, nor for the year 1887, but they may be found in the Annual Reports of the Commissioner of Agriculture.

† These few reports, prepared by the officers of the Division of Botany, have been published, not in the regular series issued by that division, but as isolated publications or in general series of the Department.

professional botanists, and several important collections received from the Government herbaria of foreign countries.

The Department of Agriculture can not, on the one hand, dispense with the use of these collections, nor should it, on the other hand, support a botanical museum which shall be unlimited in scope and erratic in development—a subject, consequently, for the loose expenditure of uncertain and perhaps extraordinary amounts of money. Having these facts in view, the Botanist has presented a plan designed to satisfy the conditions of the case. The main features of this plan are, (1) to properly house, protect, and arrange the collections; (2) to make provision for their normal and healthy growth along well-defined lines; (3) to develop the collections in their economic aspects.

NEED OF MORE COMMODIOUS QUARTERS.

The plan in question, as presented in a letter from the Botanist to the Secretary of Agriculture, dated November 8, 1893, is essentially as follows:

In view of the present pressing need in the Department of Agriculture for more commodious quarters, I desire to submit an outline plan to relieve the congested condition of the main building, and to provide fireproof quarters for valuable property.

There are in constant use in the Division of Botany collections and books which have been in process of accumulation from the time of the earliest transcontinental surveys, and in which are represented the natural vegetable resources of the country. These collections and books are under constant liability to destruction by fire, and in the event of such a deplorable accident could never be entirely replaced. Nor could they, I estimate, be brought again to their present level of value for less than \$150,000.

The Division of Botany is earnestly desirous of making use of these materials to increase the directly practical features of its work, and the moderate enlargement of its quarters preliminary to this line of development has already become a difficult problem under the present conditions.

One of the deficiencies most keenly felt at present by the Division of Botany is the lack of a sufficient library. A nucleus of a good botanical library already exists in the Department, and an examination of several of the larger libraries in Washington has disclosed an additional number of works devoted to botany, the use of many of which could without doubt be had by the Department of Agriculture under proper provisions for safe-keeping. In the present overcrowded and unsafe condition of the division the Botanist has not thought it advisable to request the loan of such books. The Department of Agriculture should have a library in which accurate information regarding the vegetable resources of the world would be at all times accessible, but at present its library is deplorably deficient in this class of books.

To bring about the desired result I would urge that steps be taken at an early date to secure a suitable building. Since the style of this building, and therefore the cost, must be decided in part by the requirements of the case, and in part by the financial exigencies of the Department, two general plans may be considered. First, a building may be erected which shall provide fireproof quarters for the herbarium and the offices of the Division of Botany, plain in design, but sufficiently commodious to satisfy immediate necessities. Such a building can probably be erected for \$25,000. On the other hand, if it is considered desirable to provide permanently for the herbarium and the work connected with it, a larger building more nearly perfect in its equipment and of a design architecturally suitable to the Department grounds should be planned. This building might at first be used to good advantage to house also one or more of the other divisions whose work is closely related to that of the Division of Botany. Without having made a detailed plan for such a structure, I estimate that it can be properly built and equipped for \$100,000, and that \$5,000 properly expended would bring the botanical library to a high standard of usefulness.

As a final means for defining the relations of these botanical collections, emphasizing their character as a national institution, and providing for their sound administration, the passage of a law containing the following provisions is advocated:

Definition of the National Herbarium.

(1) That the name United States National Herbarium shall be a general designation for all botanical collections, consisting of dried plants mounted or in condition for mounting, seeds, fruits, and other vegetable products, or representations of them, illustrating the uses of plants or the principles of the science of botany, which are now in the custody of the Department of Agriculture, in charge of the Botanist of said Department, or which may hereafter, in accordance with the provisions of this bill, be added to these collections.

Custody of the National Herbarium.

(2) That the National Herbarium shall be in the custody of the Department of Agriculture, and the Botanist of said Department shall be *ex officio* curator of said herbarium, to have charge of the collections, under the direction of the Secretary of Agriculture, and to be responsible for their management.

Additions to the National Herbarium.

(3) That in addition to the customary methods of accession by gift, deposit, loan, or purchase, any collection of plant products belonging to the United States may, with the consent of the chief officer of that branch of the Government in whose custody it is, be received as an addition to and thus become a part of the National Herbarium.

Establishment of sectional collections.

(4) That whenever in any branch of the Government necessity shall arise for the use of a special portion of the National Herbarium, such portion may be transferred as a sectional collection to such branch of the Government: *Provided*, That a guaranty of the proper safe-keeping of such sectional collection be given, and that said collection be subject to recall at any time.

Appointment of the Botanist.

(5) That the Botanist of the Department of Agriculture shall be appointed by the Secretary of Agriculture, the nomination being made by a board consisting of the president of the Civil Service Commission, the secretary of the Smithsonian Institution, and the president of the National Academy of Sciences: *Provided*, That the Secretary of Agriculture may reject any nomination and that the rights of said Secretary to dismiss the Botanist or to call for his resignation be not restricted.

It is believed that by the adoption of a course similar to that here indicated, an establishment may be perfected within two or three years, clearly defined in its relations and objects, well administered and fruitful in its results, and that the current expenses, unless a large amount of additional work is attempted, will not exceed the present appropriation.

In the course above outlined for the treatment of the Department's botanical collections the Botanist has already received the general approval of the Secretary and Assistant Secretary of Agriculture, and although the condition of the national finances at the present time prevents any recommendation for the required appropriation, it is hoped that the wisdom of this plan may so appeal to Congress as to receive from that body ultimately the funds necessary to carry it out.

FORAGE EXPERIMENTS AT GARDEN CITY, KANS.

In the year 1888, 240 acres of land 2 miles from Garden City, Kans., were secured by the U. S. Department of Agriculture on a free five-years' lease, to be used for forage experiments. The primary object of these experiments was to ascertain whether any crops other than those at that time under cultivation in the southern Great Plains (which in dry years were almost utter failures) could be grown in that region successfully without irrigation. Reports of the progress of these experiments have been made annually by the Botanist; those for the first year unfavorable, for the second, third, and fourth years promising increasingly gratifying results.

On the 31st day of October of the present year, according to previous

arrangement, the experiment farm at Garden City was formally closed, the personal property of the Department in use there having been previously advertised and sold at public auction.

The greatest importance of the results attained during this five-years' experiment lies not more in the fact that certain forage plants have been found which produce uniformly in western Kansas a good crop of hay, than in the fact that a general method of cultivation in such sub-arid regions has been brought out and the fundamental reasons for the method have been ascertained. These results may, therefore, be taken as a sound basis for similar experiments on forage plants in other parts of the western United States in which similar conditions exist. Following is a brief account of the method recommended for producing a forage crop without irrigation in western Kansas.

PREPARATION OF THE SOIL.

The ground should be plowed to a depth of 12 inches and broken up as much as possible with a common harrow. The soil should next be pulverized by the use of a fine-toothed harrow constructed especially for that purpose. The following directions for making such a harrow are given by Dr. J. A. Sewall, superintendent of the farm:

Take four oak planks, each 10 feet long, 10 inches wide, and 2 inches thick. Into each of these planks drive 400 40-penny wire nails, arranging them in 4 rows 3 inches apart, the nails also 3 inches apart in each row and projecting to a distance of 3 inches from the under side of the plank. Fasten the 4 planks together by strong iron strap hinges, bolted on. Two clevises for attaching the whipple-trees are then bolted into the edge of the forward plank and the harrow is ready for use.

The harrow here described requires four horses. A smaller one might be constructed on the same plan to be drawn by two horses, but it is probable that the expense of doing the same work with the smaller harrow would in the end be greater. The cost of this fine-toothed harrow, exclusive of labor in putting it together, is about \$6.

As a final preparation before seeding, the plowed, harrowed, and fine-harrowed ground should be thoroughly rolled and the upper surface loosened again by the fine-toothed harrow. The ground is now well prepared for the seed.

The essential points in this method of soil preparation are deep plowing, pulverizing the soil by the harrow, and heavy rolling. These principles are based both on a knowledge of the practical outcome of their application and upon actual experimental measurement of the amount of water thus held in the soil, for the retention of moisture in the ground until it can be used gradually by the growing crop is the important object gained by this method of soil preparation. In all future experimentation in the growth of nonirrigated crops in the subarid lands the same object should be kept prominently in mind.

One important fact must be mentioned here, namely, that after the ground is plowed the harrowing and rolling, and if possible the seeding also, should be completed with the greatest dispatch possible, since during these processes the loose condition of the upturned soil permits an unusually rapid evaporation of the moisture which it contains. The exact time of plowing is a question which must depend upon the careful judgment of the farmer himself, keeping in mind on the one hand the proper time for planting his crops and on the other hand the condition of the ground itself for plowing. In these regions of irregularly timed rainfall the soil may remain for several weeks at a time too dry to be plowed, and even if it could be reduced to the desired fineness no ordinary seed would germinate in it.

As an illustration of the value of the method of soil preparation described above may be cited an experiment made by Dr. Sewall in 1892. An acre of new land was plowed to the depth of 4 inches and given an ordinary harrowing. This ground was sowed to red Texas oats, a crop tested during that season on soil which had been deeply plowed, finely harrowed, and rolled. The result was that on the ground of ordinary tillage 18 bushels of grain (by weight at 32 pounds per bushel) were produced per acre; on that prepared by the special method employed at the farm 82.7 bushels per acre. There is no doubt whatever that by a proper method of manipulating the soil of subarid lands their productiveness may be remarkably increased.

THE BEST NONIRRIGATED FORAGE PLANTS FOR WESTERN KANSAS.

The necessary steps preliminary to planting the crop have already been described, and these steps are essentially the same for all the crops experimentally cultivated at Garden City. The next important consideration is that of the choice of seed, and in this respect also the experiments have been decisive. Four plants have been found well adapted to cultivation for forage in this region without irrigation, as follows:

RED KAFFIR CORN.—This is one of the varieties of sorghum (*Sorghum vulgare*) which, instead of developing a large, sugar-producing stem, grows principally into leaves. The seed should be planted in drills during the last week of May or the first week of June, the drills $3\frac{1}{2}$ feet apart and the seeds about 6 inches distant in each drill. The crop should be cultivated not with a plow but with a small fine-toothed harrow constructed after the manner of the large one previously described. This red Kaffir corn commonly produces a crop of 5 to 7 tons of dry fodder per acre, which is greedily eaten by stock, and is by many considered superior in feeding value to alfalfa.

HUNGARIAN BROME (*Bromus inermis*).—Of the grasses proper this species, which has long been cultivated on the dry plains of South-eastern Europe, has proved best adapted to the subarid region of western Kansas. It is a perennial, forming a permanent meadow, producing commonly $1\frac{1}{2}$ to 3 tons of hay per acre. The present season was an unprecedentedly dry one, only 9 inches of rain having fallen up to September 1. Of this only 3 inches fell before the middle of July, a period of more than six months, and on no one day did the rainfall exceed 0.7 inch, an amount soon evaporated from the surface of the soil and of no essential value to a growing crop. Under such adverse conditions a field of Hungarian brome on the 1st of July had produced a scant growth of blades about 6 inches long, when even the native buffalo grass of the surrounding country was as brown and dry as if dead. Following the rains of late July the Hungarian brome produced a crop of about 1 ton of hay per acre. The present season, it must be remembered, was the driest ever known in western Kansas, and the ability of Hungarian brome to produce a crop under the most adverse climatic conditions is therefore assured.

NATIVE GRASSES.—Two native grasses, switch grass (*Panicum virgatum*) and Colorado blue-stem (*Agropyrum glaucum*), have also been found successful, though to a less marked degree than Hungarian brome.

JERUSALEM CORN.—As an accessory of the forage experiments, a test has been made of the grains best adapted to the same region, with the result that one of the varieties of sorghum, known as Jerusalem corn, has been found a valuable crop. It produces 20 to 40 bushels of

threshed grain per acre, having almost the same feeding properties as maize. While there is at the present time no general market for this grain, its local value as human food and for feeding hogs, horses, and cattle is highly important, especially in a dry season like the present when the wheat and corn crops in western Kansas were total failures.

GRASSES FOR THE SOUTH.

In the year 1888 a series of forage experiments was inaugurated by the U. S. Department of Agriculture, in collaboration with the Mississippi Agricultural Experiment Station, for the purpose of improving the forage product of the southern United States. During the few years following, coöperative experiments were begun at the stations in North Carolina, Georgia, Florida, and Louisiana, all under the supervision of Prof. S. M. Tracy, of Mississippi. A report on these experiments, prepared by Prof. Tracy and submitted to the Botanist, will be transmitted for publication at an early date.

This report states that 508 species have been tried experimentally and about 35 have been found successful. For the purposes of practical agriculture, however, about a dozen of these species will fill the customary needs of the South as far as meadows and summer pastures are concerned. The lowland region of the Southern States is divided into 4 types, based upon the characters of the soil as employed for agricultural purposes, namely, the yellow loam soil, alluvial bottom lands, black prairie soil, and pine woods soil. Prof. Tracy has given an account of the forage crops best adapted to each of these soils and the best fertilizers to be used, statements which his careful study of these two questions and his long and practical experience with the needs of the region make authoritative.

As emphasizing the value of these experiments, and as indicative of the manner in which the South has taken up the cultivation of the best forage plants, the statement may be made that the census returns for 1880 show that in the five States in which these experiments have been conducted the yield of hay was 0.86 ton per acre, as compared with an average of 1.14 tons for the whole United States. The report of the Division of Statistics for November, 1893, shows that during that season these five States had increased their yield to 1.66 tons per acre, while the average for the entire country was 1.32 tons.

GINSENG CULTURE.

The commercial utilization of many of the natural plant products of the United States is a subject brought constantly to the attention of the Division of Botany by innumerable letters and specimens from all parts of the country, with questions regarding the value and uses of certain native species. In pursuance of a general plan to definitely ascertain the real utility, or to increase the already ascertained utility, of some of these products, and in order to have actual data for answering authoritatively many inquiries on a particular one of these subjects, namely, ginseng culture, arrangements have been made for collating and digesting all the available information on the cultivation of that plant. The market value of the dried root among wholesale purchasers is from \$2.50 to \$4 per pound, and its rapid exportation to the Chinese market is exhausting the limited natural supply.

MEDICINAL PLANTS.

The question of employing our native medicinal plants as remedies in disease has been for several years a subject of general consideration by the Division of Botany. It is believed that the manner in which this division can add new and valuable facts to our pharmacopœia in regard to the increased employment of our native plants in medicine lies in ascertaining by actual analysis the constituents of certain plants reputed to have medicinal properties and in testing these constituents by physiological experiment.

By coöperation with the Bureau of Animal Industry such an analysis of one of our common Western plants in popular use as a febrifuge has been made, and an alkaloid discovered which will be submitted to physiological tests. The value of a single medicinal product brought to light by this method will be far greater and more definite than the description of any number of medicinal plants the knowledge of whose properties is based on popular repute merely.

RUSSIAN THISTLE.

The Russian thistle (*Salsola kali tragus*) still continues to alarm the farmers of North and South Dakota, and is rapidly spreading over wider areas. In response to numerous inquiries and complaints regarding the amount of damage caused by it in the infested area, Mr. L. H. Dewey, assistant botanist, was again detailed in November of the present year to visit the States in which it has become firmly established and to make a report thereon. This report is nearly completed, and will be transmitted for publication in time for use during the coming season.

In addition to the facts published last year in the Annual Report and in Farmers' Bulletin No. 10, the edition of which was long since exhausted, it is ascertained this year that the plant has already covered an area of about 30,000 square miles in the States of North Dakota, South Dakota, Minnesota, Wisconsin, Iowa, Nebraska, Kansas, and Wyoming, and the damage caused by it during the present season is estimated at from \$3,000,000 to \$5,000,000. The nature of the weed is such that its progress can not be stopped by any means except concerted action against it. There is no doubt whatever that the plant will spread throughout the whole Great Plains region and still farther east, infesting a large part of the wheat-producing region of the United States. The steps to prevent this, if any are to be undertaken, should be begun at once.

PURE SEED.

A matter which has demanded the attention of national agricultural institutions of other countries, and the results of which have proved of the greatest benefit to the farmer, is some system of seed inspection, not necessarily mandatory, but advisory in its powers. With a view to ascertain the purity of the seed distributed by the U. S. Department of Agriculture, arrangements have been made for the establishment of a seed collection in the Division of Botany, in which shall ultimately be represented all our cultivated plants and all our weeds. It is proposed that with this collection as a basis, and with the work of European seed-control stations as a precedent, the Department of Agriculture shall undertake before the close of the coming year to make preliminary analyses of the seed distributed. The necessity and

the value of such seed inspection need not be discussed here, since they are both well known to those actively interested in important agricultural questions in the United States, and it is appropriate that a movement of this kind should originate at the U. S. Department of Agriculture, which has been for many years a source of governmental distribution of seeds for agricultural purposes.

Other reasons have also accentuated the demand for an authentically determined collection of seeds in the Division of Botany, especially the necessity for accurate identification of the seeds which are of importance in connection with the food habits of birds and insects.

By direction of the Secretary of Agriculture a civil-service examination has already been held for the purpose of selecting a person suitable to take charge of this work, and an appointment is now promised at an early date.

PUBLICATIONS OF THE YEAR.

The following publications have been issued by the Division of Botany during the year 1893:

Farmers' Bulletin No. 10. The Russian Thistle and Other Troublesome Weeds in the Wheat Region of Minnesota and North and South Dakota. By L. H. Dewey. 1893. 8°, pp. 18, 2 plates.

Bulletin No. 13. Grasses of the Pacific Slope, including Alaska and the Adjacent Islands. Plates and descriptions of the grasses of California, Oregon, Washington, and the Northwestern Coast, including Alaska. By George Vasey. Part II. Issued June 1, 1893. Roy. 8°, pp. 108, 50 plates.

Report of the Botanist for 1892. By George Vasey. 1893. 8°, pp. 201-214, 9 plates.

Contributions from the U. S. National Herbarium, Vol. I, No. 7. Systematic and Alphabetic Index to New Species of North American Phanerogams and Pteridophytes published in 1892; by Josephine A. Clark; issued July 15, 1893. 8°, pp. III, 233-264, index.

Contributions from the U. S. National Herbarium, Vol. I, No. 8. Notes on some Pacific Coast Grasses, by George Vasey; Descriptions of New or Noteworthy Grasses from the United States, by George Vasey; Descriptions of New Grasses from Mexico, by George Vasey; Descriptions of New Plants from Texas and Colorado, by J. M. Holzinger; List of Plants New to Florida, by J. M. Holzinger; descriptions of Three New Plants, by J. N. Rose; List of Lichens from California and Mexico, Collected by Dr. Edward Palmer from 1888 to 1892, by J. W. Eckfeldt. Issued October 31, 1893. 8°, pp. III, 265-262, index, 5 plates.

Contributions from the U. S. National Herbarium, Vol. IV. Botany of the Death Valley Expedition. A Report on the Botany of the Expedition sent out in 1891 by the U. S. Department of Agriculture to make a Biological Survey of the Region of Death Valley, California. By Frederick Vernon Coville. Issued November 29, 1893. 8°, pp. VIII, 363, 21 plates and frontispiece.

RECOMMENDATIONS.

In addition to the new work already undertaken by the Division of Botany, it is desirable that other problems in economic botany should receive immediate attention. One of the most important of these is a continuation of the forage experiment work in the South and the West. While for certain areas and in certain directions of improvement the experiments are already conclusive, so far as the Department of Agriculture is concerned, it is eminently desirable that similar experiments be tried on new areas, and that additional lines of investigation be taken up. The Botanist will submit at an early date a general plan for the development of this work along two lines: (1) The preparation of publications which shall present an accurate scientific knowledge of our forage plants; (2) the conducting of experiments which shall aim to place in an immediately available form the best practical knowledge attainable on the cultivation and commercial value of these plants in directions other than those already investigated by the Department of Agriculture.

